

§ 33.53

pressure and speed settings for rated maximum continuous power at the higher supercharger speed ratio must be obtainable within five seconds.

[Doc. No. 3025, 29 FR 7453, June 10, 1964, as amended by Amdt. 33-3, 32 FR 3737, Mar. 4, 1967]

§ 33.53 Engine system and component tests.

(a) For those systems and components that cannot be adequately substantiated in accordance with endurance testing of § 33.49, the applicant must conduct additional tests to demonstrate that systems or components are able to perform the intended functions in all declared environmental and operating conditions.

(b) Temperature limits must be established for each component that requires temperature controlling provisions in the aircraft installation to assure satisfactory functioning, reliability, and durability.

[Docket No. 3025, 29 FR 7453, June 10, 1964, as amended by Amdt. No. 33-26, 73 FR 48285, Aug. 19, 2008]

§ 33.55 Teardown inspection.

After completing the endurance test—

(a) Each engine must be completely disassembled;

(b) Each component having an adjustment setting and a functioning characteristic that can be established independent of installation on the engine must retain each setting and functioning characteristic within the limits that were established and recorded at the beginning of the test; and

(c) Each engine component must conform to the type design and be eligible for incorporation into an engine for continued operation, in accordance with information submitted in compliance with § 33.4.

[Amdt. 33-6, 39 FR 35466, Oct. 1, 1974, as amended by Amdt. 33-9, 45 FR 60181, Sept. 11, 1980]

§ 33.57 General conduct of block tests.

(a) The applicant may, in conducting the block tests, use separate engines of identical design and construction in the vibration, calibration, detonation, endurance, and operation tests, except

14 CFR Ch. I (1–1–09 Edition)

that, if a separate engine is used for the endurance test it must be subjected to a calibration check before starting the endurance test.

(b) The applicant may service and make minor repairs to the engine during the block tests in accordance with the service and maintenance instructions submitted in compliance with § 33.4. If the frequency of the service is excessive, or the number of stops due to engine malfunction is excessive, or a major repair, or replacement of a part is found necessary during the block tests or as the result of findings from the teardown inspection, the engine or its parts may be subjected to any additional test the Administrator finds necessary.

(c) Each applicant must furnish all testing facilities, including equipment and competent personnel, to conduct the block tests.

[Doc. No. 3025, 29 FR 7453, June 10, 1964, as amended by Amdt. 33-6, 39 FR 35466, Oct. 1, 1974; Amdt. 33-9, 45 FR 60181, Sept. 11, 1980]

Subpart E—Design and Construction; Turbine Aircraft Engines

§ 33.61 Applicability.

This subpart prescribes additional design and construction requirements for turbine aircraft engines.

§ 33.62 Stress analysis.

A stress analysis must be performed on each turbine engine showing the design safety margin of each turbine engine rotor, spacer, and rotor shaft.

[Amdt. 33-6, 39 FR 35466, Oct. 1, 1974]

§ 33.63 Vibration.

Each engine must be designed and constructed to function throughout its declared flight envelope and operating range of rotational speeds and power/thrust, without inducing excessive stress in any engine part because of vibration and without imparting excessive vibration forces to the aircraft structure.

[Doc. No. 28107, 61 FR 28433, June 4, 1996]

§ 33.64 Pressurized engine static parts.

(a) Strength. The applicant must establish by test, validated analysis, or a

combination of both, that all static parts subject to significant gas or liquid pressure loads for a stabilized period of one minute will not:

(1) Exhibit permanent distortion beyond serviceable limits or exhibit leakage that could create a hazardous condition when subjected to the greater of the following pressures:

- (i) 1.1 times the maximum working pressure;
- (ii) 1.33 times the normal working pressure; or
- (iii) 35 kPa (5 p.s.i.) above the normal working pressure.

(2) Exhibit fracture or burst when subjected to the greater of the following pressures:

- (i) 1.15 times the maximum possible pressure;
- (ii) 1.5 times the maximum working pressure; or
- (iii) 35 kPa (5 p.s.i.) above the maximum possible pressure.

(b) Compliance with this section must take into account:

- (1) The operating temperature of the part;
- (2) Any other significant static loads in addition to pressure loads;
- (3) Minimum properties representative of both the material and the processes used in the construction of the part; and
- (4) Any adverse geometry conditions allowed by the type design.

[Amdt. 33-27; 73 FR 55437, Sept. 25, 2008; Amdt. 33-27, 73 FR 57235, Oct. 2, 2008]

§ 33.65 Surge and stall characteristics.

When the engine is operated in accordance with operating instructions required by § 33.5(b), starting, a change of power or thrust, power or thrust augmentation, limiting inlet air distortion, or inlet air temperature may not cause surge or stall to the extent that flameout, structural failure, over-temperature, or failure of the engine to recover power or thrust will occur at any point in the operating envelope.

[Amdt. 33-6, 39 FR 35466, Oct. 1, 1974]

§ 33.66 Bleed air system.

The engine must supply bleed air without adverse effect on the engine, excluding reduced thrust or power output, at all conditions up to the dis-

charge flow conditions established as a limitation under § 33.7(c)(11). If bleed air used for engine anti-icing can be controlled, provision must be made for a means to indicate the functioning of the engine ice protection system.

[Amdt. 33-10, 49 FR 6851, Feb. 23, 1984]

§ 33.67 Fuel system.

(a) With fuel supplied to the engine at the flow and pressure specified by the applicant, the engine must function properly under each operating condition required by this part. Each fuel control adjusting means that may not be manipulated while the fuel control device is mounted on the engine must be secured by a locking device and sealed, or otherwise be inaccessible. All other fuel control adjusting means must be accessible and marked to indicate the function of the adjustment unless the function is obvious.

(b) There must be a fuel strainer or filter between the engine fuel inlet opening and the inlet of either the fuel metering device or the engine-driven positive displacement pump whichever is nearer the engine fuel inlet. In addition, the following provisions apply to each strainer or filter required by this paragraph (b):

(1) It must be accessible for draining and cleaning and must incorporate a screen or element that is easily removable.

(2) It must have a sediment trap and drain except that it need not have a drain if the strainer or filter is easily removable for drain purposes.

(3) It must be mounted so that its weight is not supported by the connecting lines or by the inlet or outlet connections of the strainer or filter, unless adequate strength margins under all loading conditions are provided in the lines and connections.

(4) It must have the type and degree of fuel filtering specified as necessary for protection of the engine fuel system against foreign particles in the fuel. The applicant must show:

(i) That foreign particles passing through the specified filtering means do not impair the engine fuel system functioning; and

(ii) That the fuel system is capable of sustained operation throughout its flow and pressure range with the fuel